Research on a User-Demand-Based Resource Support System for Agricultural and Forestry University Libraries*

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Abstract

To address the mismatch between resource development in university libraries and users' actual needs, and to enhance the targeting of resource support, this study constructs an analytical framework of "data cleaning–topic clustering–demand identification" based on 1,906 work logs from 28 Science and Technology Backyards of China Agricultural University. Using TF-IDF and HDBSCAN clustering methods, it identifies five categories of core resource needs: agricultural economic systems, markets, and globalization; application of agricultural production technologies and socialized services; agricultural policies and livelihood security systems; agricultural ecological security and research systems; and agricultural intelligent systems and knowledge engineering. Accordingly, the study proposes a demand-oriented five-dimensional resource support system and a multidimensional collaborative dynamic mechanism for data sharing and resource complementarity. It further constructs a set of resource support implementation strategies encompassing dynamic demand monitoring and adjustment, collaborative resource development among government, industry, academia, research, and users, improvement of knowledge organization and discovery effectiveness, optimization driven by scientific benefit evaluation, and expansion of service scenarios. This provides a basis for the transformation of resource development in agricultural and forestry university libraries from "passive supply" to "proactive support," and offers a resource foundation for serving rural revitalization.

Full Text

【Profession ・Management】

Research on a User-Demand-Based Resource Support System for Agricultural and Forestry University Libraries*

—A Case Study of the Science and Technology Backyards of China Agricultural University

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[**Abstract**] To address the disconnection between resource development in university libraries and users' real needs, and to improve the pertinence of resource support, this study, based on 1,906 work logs from 28 Science and Technology Backyards of China Agricultural University, constructs an analytical framework of "data cleaning—topic clustering—demand identification." Using TF-IDF and HDBSCAN clustering methods, it identifies five categories of core resource needs: agricultural economic systems, markets and globalization; agricultural production technology applications and socialized services; agricultural policies and livelihood security systems; agricultural ecological security and research systems; and agricultural intelligent systems and knowledge engineering. On this basis, the study proposes a demand-oriented five-dimensional resource support system and a multidimensional collaborative dynamic mechanism for data sharing and resource complementarity. It further constructs a set of implementation strategies for resource support, including dynamic monitoring and adjustment of demand, collaborative resource development among "government, industry, universities, research institutes, and users," improvement of knowledge organization and discovery effectiveness, optimization driven by scientific benefit evaluation, and expansion of service fields. The study provides a basis for agricultural and forestry university libraries to transform resource development from "passive supply" to "active support," and offers a resource foundation for serving rural revitalization.

[**Keywords**] Science and Technology Backyard; text mining; demand analysis; resource development; resource support; university library

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Introduction

The Science and Technology Backyard was first created by China Agricultural University in 2009. It is a service platform integrating agricultural science and technology innovation, technology extension, and talent cultivation[^1]. As of 2024, more than 1,800 Science and Technology Backyards had been established nationwide[^2]. In 2024 and 2025, they were written into the No. 1 Central Document for two consecutive years, becoming an important practical carrier of the rural revitalization strategy. The core model of the Science and Technology Backyard is "research + service + talent cultivation" : graduate students reside on the front line, improve their professional competence by solving practical problems in agricultural production[^3], and at the same time transform research achievements into technologies that farmers can use, thereby promoting agricultural modernization[^4–^5].

With the scaled development of Science and Technology Backyards, the contradiction between their resource service needs and the supporting system has become increasingly prominent. On the one hand, Science and Technology Backyards generate large amounts of unstructured data each year, such as field experiment logs and technical reports, but lack a unified integration platform, resulting in the problem of data "fragmentation." On the other hand, resident personnel' s demand for resources such as intelligent analysis tools and policy interpretation has become increasingly diversified, while the existing resource support system of university libraries has structural defects. Among them, the imbalance in resource structure is particularly prominent: current library collections show a tendency to emphasize academic resources while neglecting applied resources, lacking market-oriented economic data, practical production technical manuals, local policy interpretations, and other resources that fit the actual scenarios of Science and Technology Backyards. This has led to a serious disconnect between the resource system and users' frontline needs. The underlying reason is mainly that resource development has long followed a resource-driven model rather than a demand-driven model, which runs counter to the direction of integrated development of resource services that university libraries are actively exploring[^6]. A deeper reason lies in systemic obstacles at the level of organizational management. Relevant studies have pointed out that the administrative management system of university libraries has structural defects, with imperfect macro-control mechanisms, fragmented governance, and a lack of unified coordination mechanisms[^7]. In addition, university libraries generally face the difficulties of budget tightening and reductions in the number of librarians. While enrollment continues to expand, insufficient librarian staffing and the pressure of serving multiple campuses have become severe challenges constraining the improvement of service quality[^8]. The lag in technical support also limits service responsiveness. In the face of the urgent needs of new innovation models such as organized research for interdisciplinary and whole-process knowledge services, the traditional service model of libraries is insufficient in both the breadth of resource integration and the depth of knowledge mining, making it difficult to realize research

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rapid response to needs and proactive support [9].

Although the China Agricultural University Library has established a service station for Science and Technology Backyards, against the backdrop of scaled development and diversified needs, its support system still faces three challenges. First, the types of collection resources are relatively unitary, making it difficult to meet the diversified and scenario-based needs of the Backyards. Second, needs identification is not sufficiently precise; decisions on resource procurement and renewals still remain in an experience-driven mode, lacking a data-supported precision mechanism, and there is a gap with the concept of user-demand-guided services. Third, resource integration and disclosure are insufficient: existing diversified data resources have not been effectively organized and pushed according to the Backyards' demand themes. Therefore, it is urgently necessary to explore paths, methods, and strategies that can accurately identify the characteristics of resource needs and improve the efficiency of resource allocation.

Taking 1,906 work logs from 28 Science and Technology Backyards of China Agricultural University as the research object, this study uses "data cleaning—topic clustering—needs identification" as its analytical framework. It applies TF-IDF (Term Frequency-Inverse Document Frequency) and HDBSCAN (Hierarchical Density-Based Spatial Clustering of Applications with Noise) clustering methods to reveal the authentic resource needs of frontline scientific research and production. By identifying core resource needs, this study explores a new demand-driven model for university library resource development, improves the precision and effectiveness of resource procurement and construction, provides theoretical reference for agricultural and forestry institutions in formulating collection development policies, and helps fulfill the practical requirement of Science and Technology Backyards to "address people' s livelihood issues and pursue scholarship in serving rural revitalization" [10].

1 Research Design and Methods

1.1 Analytical Framework and Technical Route

This study uses CNKI and Wanfang as databases and sets the search query as "(Science and Technology Backyard AND library services) OR (agricultural information resources AND rural revitalization)" to obtain relevant literature. It then systematically reviews the development status of Science and Technology Backyards, the service models of university libraries, and commonly used methods for identifying user needs, thereby clarifying deficiencies in existing research and the theoretical foundation. On this basis, the work-log texts of Science and Technology Backyards are further introduced as first-hand empirical materials to mine resource-demand characteristics in real scenarios. Following the principles of "interpretability and reproducibility," this study sequentially designs standardized procedures for data preprocessing, text-topic clustering, and the classification and identification of user needs, ultimately constructing an analytical framework and technical route of "data cleaning—topic clustering—needs identification" (see Figure 1).

Figure content:

- **Research logic**
  - Pose the problem
  - Analyze the problem
  - Solve the problem
- **Research content**
  - Research background and development trends
  - Current status and models of university-library services for Science and Technology Backyards
  - Determine the research significance and direction
  - Data collection
    * Download logs from official websites
    * Collect logs offline
  - Text preprocessing
    * Jieba word segmentation
    * Filter function words
    * Part-of-speech screening
    * Delete low-frequency words
    * Validate terms
  - TF-IDF modeling
    * TF-IDF matrix
    * Cosine similarity matrix
  - Clustering
    * HDBSCAN clustering method
    * Evaluate clustering performance
    * Visualization of topic scatter plot
    * Extract core representative words for each cluster
  - Topic induction
    * Summarize clustering results
    * Complete secondary induction through hierarchical clustering
    * Generate a demand-distribution table and dendrogram
  - Construction of the resource support system
    * Shift from resource-driven to demand-driven
    * Multidimensional resource collaborative integration mechanism
  - Implementation strategies for the resource support system
    * Propose specific strategies for the support system
- **Research methods**
  - Literature research method
  - Text-mining method
  - Cluster-analysis method
  - Summarization and induction method

Figure 1. Technical Route

1.2 Data Sources and Preprocessing

The data for this study were collected in two ways: through downloading from the National Science and Technology Backyard Service Management Platform and through offline contact. As of May 17, 2024, a total of 1,906 work logs from 28 Science and Technology Backyards of China Agricultural University were obtained.

electronic work logs. The sample covers 15 provinces (autonomous regions and municipalities directly under the central government) across five administrative-geographical regions—North China, East China, Central and South China, Northwest China, and Southwest China. The industries represented include field crops (such as wheat, maize, and rice), cash crops (such as tomato, dragon fruit, pomegranate, and sugarcane), and livestock breeding (such as Hu sheep and meat rabbits), among other fields, and involve related agricultural technologies. Thus, the sample has good spatial representativeness and industrial diversity. The number of work logs varies among the Science and Technology Backyards. Backyards with larger log volumes provided continuous observational data, facilitating in-depth analysis of specific agricultural scenarios; those with fewer logs but distinct types broadened the industrial scope of the sample coverage, ensuring that demands from multiple characteristic industries were included in the analytical perspective. This sample structure, complementary in both depth and breadth, provides data support for constructing a comprehensive and multidimensional demand-identification model.

Data processing followed the workflow of "cleaning—word segmentation—stop-word removal—word-frequency statistics—high-frequency word screening." First, the original logs were cleaned to remove redundant symbols, generating a plain-text corpus of about 2.05 million Chinese characters. Next, the jieba word-segmentation tool was used for segmentation and part-of-speech tagging, retaining content words such as nouns, verbs, and adjectives. Then, meaningless vocabulary was filtered using a manually compiled stop-word list[11–13]. Finally, word frequencies were counted. To ensure that the analytical objects could effectively represent the core semantics of scientific research and production in the Science and Technology Backyards, 1,188 high-frequency words appearing 50 times or more were selected as the core corpus for subsequent analysis.

1.3 Text Mining and Clustering Methods

Based on the data characteristics and research objectives, this study adopts a method combining the TF-IDF algorithm with HDBSCAN density clustering to identify demand themes from high-frequency words. The work logs of the Science and Technology Backyards are characterized by short text, colloquial expression, and strong professional specificity. Traditional LDA topic models are susceptible to interference from data sparsity when processing such texts, while pretrained-model-based approaches (such as BERTopic) may have limitations in adapting to the semantics of specific domains. By comparison, HDBSCAN does not require the number of clusters to be preset; it can automatically identify cluster boundaries and noise points, and can adapt to irregular cluster shapes in semantic distributions. It therefore better fits the data characteristics and exploratory aims of this study, while also accommodating the complex semantic distributions and irregular cluster forms of Science and Technology Backyard logs[14-15]. The TF-IDF algorithm quantifies the importance of words in the corpus[16]: term frequency (TF) reflects the local importance of a word in a single log, while inverse document frequency (IDF) suppresses "pseudo-important words" that occur with high frequency in only a few documents, thereby balancing local high frequency with global distinctiveness.

In this study, a TF-IDF weight matrix with dimensions of 1,188 $\times$ 28 was constructed based on the distribution of the 1,188 high-frequency words across the logs of 28 Backyards, serving as the input for subsequent clustering analysis. The HDBSCAN algorithm was used to cluster the feature words. The specific procedure was as follows: first, the UMAP algorithm was applied to reduce the dimensionality of the high-dimensional TF-IDF matrix in order to improve clustering efficiency. After repeated experimental testing, the optimal dimensionality-reduction parameters were determined as "`n_neighbors = 20`," "`min_dist = 0.1`," and "`metric = cosine`." HDBSCAN clustering was then performed, and fine-grained topic division was achieved by dynamically adjusting parameters.

Clustering performance was evaluated using the Silhouette Coefficient and the DBCV index (Density-Based Cluster Validation) to ensure the statistical reliability of the results[17-20]. According to commonly used evaluation criteria, a silhouette coefficient greater than 0.5 indicates a reasonable clustering structure, while a DBCV value greater than 0.3 indicates good cluster density and separation. In this study, when inferring the intensity of resource demand based on word semantics and topic frequency, possible biases introduced by factors such as log-recording habits were taken into account. The final silhouette coefficient was 0.529 and the DBCV value was 0.326; both indicators reached the evaluation thresholds, indicating that the clustering effect was good and statistically acceptable. In addition, this study introduced parallel research based on grounded theory for cross-validation[21]; the independently identified demand system and the quantitative results of this paper form a useful complement to each other.

2 Results and Analysis of Demand-Theme Identification

2.1 Clustering Results and Topic Generation

Through HDBSCAN density-clustering analysis of the 1,188 high-frequency words, this study identified 27 initial topic clusters in total (numbered C0 to C26). For example, the representative words of C0 (agricultural policy system and people's livelihood) include countryside, era, people, cause, and thought; C1 (agricultural markets and economic benefits) involves industrialization, tomatoes, interests, reporting, and industrial chains; C3 (intelligent detection of crop characteristics) contains vocabulary closely related to technological applications, such as characteristics, sampling, software, watermelon, vinegar, identification, and insects; and C7 (crop cultivation and soil improvement) covers agronomic-practice-related terms such as water volume, plants, growth, yield improvement, seedlings, and air permeability.

On the basis of the initial clustering results, according to the semantic associations between clusters and their neighborhood relationships in the UMAP two-dimensional space, the 27 initial topics were merged into five core demand themes (numbered A0 to A4) through a two-stage induction method, as shown in Table 1 and Figure 2. To improve the objectivity of the topic-merging process, this study tested the clustering results through semantic-similarity validation and calculated the within-group average similarity of the five core themes and the between-group similarity matrix (see Table 2).

Table 1 Topics and Representative Terms of Each Group

Core theme	Intermediate theme	Initial topic
A0 Agricultural economic system, markets, and globalization	B0 Optimization of agricultural production factors and international production-capacity cooperation	C8 Agricultural materials and elements
A0 Agricultural economic system, markets, and globalization	B0 Optimization of agricultural production factors and international production-capacity cooperation	C11 Agricultural productivity research
A0 Agricultural economic system, markets, and globalization	B0 Optimization of agricultural production factors and international production-capacity cooperation	C16 Field crop management
A0 Agricultural economic system, markets, and globalization	B0 Optimization of agricultural production factors and international production-capacity cooperation	C23 Agricultural preparatory work

Core theme	Intermediate theme	Initial topic
A0 Agricultural economic system, markets, and globalization	B0 Optimization of agricultural production factors and international production-capacity cooperation	C26 International agricultural production-capacity coordination
A0 Agricultural economic system, markets, and globalization	B1 Agricultural management mechanisms	C6 Management mechanisms and implementation
A0 Agricultural economic system, markets, and globalization	B2 Agricultural marketization and industrial chains	C1 Agricultural markets and economic benefits

Table 1 (continued)

Core topic	Intermediate topic	Initial topic
A1 Agricultural production technology applications and socialized services	B3 Planting technology and environmental regulation	C14 Planting technology
A1 Agricultural production technology applications and socialized services	B3 Planting technology and environmental regulation	C15 Soil environment and element research
A1 Agricultural production technology applications and socialized services	B4 Researchers' daily-life health management and basic research	C9 Social interaction and daily life
A1 Agricultural production technology applications and socialized services	B4 Researchers' daily-life health management and basic research	C10 Occupational safety, emergency management, and health
A1 Agricultural production technology applications and socialized services	B4 Researchers' daily-life health management and basic research	C12 Everyday life
A1 Agricultural production technology applications and socialized services	B4 Researchers' daily-life health management and basic research	C13 Academic resources and research

Core topic	Intermediate topic	Initial topic
A1 Agricultural production technology applications and socialized services	B4 Researchers' daily-life health management and basic research	C17 Labor and outreach work
A1 Agricultural production technology applications and socialized services	B4 Researchers' daily-life health management and basic research	C22 Biological indicator detection technology
A1 Agricultural production technology applications and socialized services	B5 Technology dissemination and academic exchange	C24 Technology dissemination and media production
A1 Agricultural production technology applications and socialized services	B5 Technology dissemination and academic exchange	C25 Academic conferences and exchanges
A2 Agricultural policies and the livelihood security system	B6 Agricultural policies and the livelihood security system	C0 Agricultural policy system and people' s livelihood
A3 Agricultural ecological security and scientific research system	B7 Sustainable planting and ecological governance	C4 Organic agriculture and pest and disease control
A3 Agricultural ecological security and scientific research system	B7 Sustainable planting and ecological governance	C7 Crop cultivation and soil improvement
A3 Agricultural ecological security and scientific research system	B8 Digitalization of agricultural research data and intelligent detection	C2 Research-data collection and teaching
A3 Agricultural ecological security and scientific research system	B8 Digitalization of agricultural research data and intelligent detection	C3 Intelligent detection of crop traits
A4 Agricultural intelligent systems and knowledge engineering	B9 Integration of agricultural intelligent technologies and construction of knowledge systems	C5 Development of agricultural intelligence

Core topic	Intermediate topic	Initial topic
A4 Agricultural intelligent systems and knowledge engineering	B9 Integration of agricultural intelligent technologies and construction of knowledge systems	C18 Agricultural production experience and efficiency improvement
A4 Agricultural intelligent systems and knowledge engineering	B9 Integration of agricultural intelligent technologies and construction of knowledge systems	C19 Knowledge management and application
A4 Agricultural intelligent systems and knowledge engineering	B9 Integration of agricultural intelligent technologies and construction of knowledge systems	C20 System operation and maintenance
A4 Agricultural intelligent systems and knowledge engineering	B9 Integration of agricultural intelligent technologies and construction of knowledge systems	C21 Solutions to practical problems and learning exchange

Figure 2. Topic scatter plot

Labels shown in the figure include: UMAP Dimension 1; UMAP Dimension 2; A0 Agricultural economic system, markets, and globalization; A1 Agricultural production technology applications and socialized services; A2 Agricultural policies and the livelihood security system; A3 Agricultural ecological security and scientific research system; A4 Agricultural intelligent systems and knowledge engineering. Numbered topic points 0–26 are shown.

Table 2 Semantic similarity of topics

	A0	A1	A2	A3	A4
A0	0.309	0.128	0.042	0.115	0.132
A1	0.128	0.400	0.035	0.093	0.066
A2	0.042	0.035	0.427	0.022	0.042
A3	0.115	0.093	0.022	0.328	0.133
A4	0.132	0.066	0.042	0.133	0.403

As shown in Table 2, the within-group semantic similarity of each group ranges from 0.309 to 0.427, whereas the between-group similarity is generally lower than 0.15 and markedly below the within-group level. This indicates that the five core topics are well differentiated and that the clustering structure is stable, providing an objective basis for topic merging. The classification results were reviewed by domain experts and show good alignment with practical needs. The composition and proportions of each topic are shown in Figure 3; they not only reveal the differentiated characteristics of the practical focus of Science and Technology Backyards, but also provide a decision-making basis for agricultural and forestry university libraries to optimize collection structures and allocate resources.

Figure 3. Distribution and proportions of five-dimensional resource-demand topics for Science and Technology Backyards

Text shown in the figure includes:

- A3 Agricultural ecological security and scientific research system, 30.3%: C7 Crop cultivation and soil improvement, 20.3%; C4 Organic agriculture and pest and disease control, 3.5%; C3 Intelligent detection of crop traits, 4.7%; C2 Research-data collection and teaching, 1.8%.
- A1 Agricultural production technology applications and socialized services, 27.2%: C15 Soil environment and element research, 8.8%; C14 Planting technology, 2.0%; C24 Technology dissemination and media production, 4.3%; C10 Occupational safety, emergency management, and health, 2.2%; C22 Biological indicator detection technology, 2.2%; C9 Social interaction and daily life, 2.0%; C17 Labor and outreach work, 2.0%; C12 Everyday life, 1.2%; C13 Academic resources and research, 1.2%; C25 Academic conferences and exchanges, 1.3%.
- A0 Agricultural economic system, markets, and globalization, 25.7%: C26 International agricultural production-capacity coordination, 4.7%; C11 Agricultural productivity research, 3.6%; C16 Field-crop management, 1.4%; C8 Agricultural materials and elements, 1.1%; C23 Agricultural preparation work, 1.0%; C6 Management mechanisms and implementation, 8.2%; C1 Agricultural markets and economic benefits, 5.7%.
- A4 Agricultural intelligent systems and knowledge engineering, 14.2%: C19 Knowledge management and application, 4.5%; C21 Solutions to practical problems and learning exchange, 3.2%; C5 Development of agricultural intelligence, 2.7%; C18 Agricultural production experience and efficiency improvement, 2.1%; C20 System operation and maintenance, 1.7%.
- A2 Agricultural policies and the livelihood security system, 2.6%: C0 Agricultural policy system and people' s livelihood, 2.6%.

Legend: A0 Agricultural economic system, markets, and globalization; A1 Agricultural production technology applications and socialized services; A2 Agricultural policies and the livelihood security system; A3 Agricultural ecological security and scientific research system; A4 Agricultural intelligent systems and knowledge engineering.

2.2 Demand Results and Thematic Analysis

In summary, ranking the five core demand themes by their proportions yields the following insights.

The demand for A3 (agricultural ecological security and the scientific research system, 30.3%) accounts for the highest proportion, highlighting the central position of Science and Technology Backyards in the national strategy for food security and sustainable development. This indicates that, in future resource procurement and budget allocation, libraries should give priority to core resources in such fields as environmental science, ecology, soil science, and plant protection—for example, providing ecological-environment monitoring data, meteorological data, and pest and disease databases. Ensuring the completeness, continuity, and frontier orientation of such resources is the foundation for supporting the scientific research and problem-solving work of Science and Technology Backyards.

The demand for A1 (application of agricultural production technologies and socialized services, 27.2%) is also relatively high, profoundly reflecting the fundamental attribute of Science and Technology Backyards as "solving practical problems in agricultural production." At present, the library resource-development system, which is dominated by academic literature, has evident shortcomings; it is urgent to strengthen the collection and development of practical-technology grey literature and multimedia resources. Libraries should systematically collect resources such as technical procedures, standards manuals, pest and disease atlases, and videos on agricultural machinery operation, and build a "knowledge base for agricultural production technology practice." This transformation is the key to libraries moving from "academic support" toward "practice empowerment."

The demand for A0 (agricultural economic systems, markets, and globalization, 25.7%) also accounts for a relatively high proportion, reflecting that the vision of Science and Technology Backyards is shifting from local production to global industrial chains. Therefore, libraries need to move beyond the traditional approach of focusing only on production technologies and, in a timely manner, introduce global agricultural product market databases, international trade policy databases, and domestic regional economic statistical databases. These will provide intelligence support for Science and Technology Backyards in participating in global agricultural competition and analyzing market risks, helping them achieve the leap from "producing well" to "selling well."

A4 (agricultural intelligent systems and knowledge engineering, 14.2%), as an emerging demand, already accounts for a certain proportion, foreshadowing the inevitable trend of smart agricultural development. Library resource development should therefore be more forward-looking, evaluating and introducing relevant databases, tool software, and training resources for the application of artificial intelligence, big-data analysis, and knowledge-graph technologies in agriculture, so as to provide a resource foundation for the digital transformation and intelligent upgrading of Science and Technology Backyards.

The demand for A2 (agricultural policy and livelihood-security systems, 2.6%) accounts for a relatively low proportion. This may be because log records focus more on daily scientific research and production activities than on policy interpretation; in addition, policy information is usually obtained through specific channels such as government websites and internal notices, and thus is not fully reflected in daily work logs. This does not mean that such demand is unimportant; rather, it reminds libraries that they should not passively wait for demand, but should proactively build a "specialized resource database on agricultural and rural policies," systematically collect and interpret policy regulations at all levels, and develop "policy toolkits." In this way, libraries can guide, stimulate, and meet the potential needs of researchers and farmers, and play a pivotal role in policy-information transmission.

In sum, the library resource demands of Science and Technology Backyards exhibit complex characteristics: equal emphasis on academic and practical needs, interweaving of localization and globalization, and coexistence of traditional technologies with intelligent frontiers. At present, the resource system of university libraries, centered on academic electronic literature, is clearly misaligned with the above needs. Therefore, based on the results of this demand analysis, libraries can adjust their resource-development focus and budget-investment structure in a targeted manner, greatly raising the construction priority of resources related to practical technologies, economic intelligence, and intelligent tools, and gradually build a diversified and precise resource-support system that is highly aligned with the needs of Science and Technology Backyards.

3 Construction and Implementation Strategies for the Resource-Support System

3.1 Construction of the Resource-Support Pathway System

Based on the above resource needs, this study constructs a library resource-support system oriented toward Science and Technology Backyards. Its core is to realize a paradigm shift from resource-driven to demand-driven development. The specific construction contents and support mechanisms are as follows:

3.1.1 Support for Economic Intelligence Resources

To meet the information needs of Science and Technology Backyards in participating in global agricultural competition, libraries need to clarify the development priorities for economic intelligence resource support and implement corresponding measures. Specifically: First, promote the productization of economic intelligence. On the basis of introducing authoritative commercial databases and systematically purchasing global agricultural product market data, the library' s intelligence department should take the lead, work jointly with relevant departments, and regularly prepare and push out a series of briefs on global agricultural markets. At the same time, it should systematically integrate domestic and foreign industry reports and research outputs from leading consulting institutions, build specialized databases, and thereby provide customized feasibility-analysis reports on production-capacity cooperation for Science and Technology Backyards. Second, initiate the construction of regional economic databases. Libraries should systematically collect and integrate agricultural statistical yearbooks from provinces and cities as well as industrial planning reports for specialty agricultural products, and build specialized regional agricultural economy databases, thereby providing data support for analyzing the domestic agricultural industrial layout and regional competitiveness. To ensure the realization of the above resource-development goals, the following mechanisms need to be established: first, a special budget for economic intelligence resources should be set up within the annual resource-procurement budget; second, a mechanism for resource co-construction, sharing, and demand consultation should be established with such departments as the university' s school of economics and management and office of international exchange.

3.1.2 Support for Applied Technology Resources

In response to the core needs of production-technology application and socialized services, library support for applied technology resources can proceed from the following two aspects. First, build a practical knowledge base. Resource collection should be extended to the fields and production front line, systematically collecting grey literature such as technical procedures for the cultivation and breeding of various crops, livestock, and poultry; local standards; standard operating manuals; pest and disease prevention and control atlases; and videos on the operation and maintenance of agricultural machinery. Through integration and digitization, field-technology response manuals convenient for on-site inquiry should be compiled, forming portable knowledge tools that can directly guide production. Second, integrate multimedia resources. An agricultural-technology multimedia resource database should be built, covering agricultural-technology teaching videos, images on the operation and maintenance of agricultural machinery, and related content; relying on the massive···

first-hand materials, build an in-house "Agricultural Production Technology Practice Knowledge Base," and include technical solutions and best-practice cases. Together with the multimedia resource database, this would constitute a searchable and reusable smart resource system. To ensure orderly resource collection and efficient organization, resource acquisition channels should be expanded, and cooperative relationships should be established with agricultural enterprises, cooperatives, and agricultural technology extension stations to obtain front-line technical materials. Metadata standards and cataloging rules for practical technical resources should be formulated to improve the discoverability and standardization of such nontraditional resources.

3.1.3 Policy Literature Resource Support

Although its proportion is relatively low, the demand for policy and livelihood-security support remains crucial. Libraries need to shift from being passive to being proactive and actively provide policy literature resources. Specific measures are as follows: First, deepen the development of policy resources. On the basis of systematically building a database covering agricultural policies and regulations from the national level to the county level, develop online policy-calculation tools to simplify subsidy application procedures, and compile a series of "understand-at-a-glance" policy infographics, transforming macro-level and complex provisions into intuitive and easy-to-use policy application toolkits. Second, establish a collaborative feedback mechanism. Fixed channels for information transmission and exchange should be established with government agencies such as local agriculture and rural affairs bureaus; public opinions and policy suggestions collected by Science and Technology Backyards should be regularly sorted, compiled, and submitted, forming a closed-loop system from policy information collection to practical feedback. To ensure the authority, timeliness, and usability of policy resources, fixed information-interaction mechanisms should be established with the Ministry of Agriculture and Rural Affairs, policy research departments, local agriculture and rural affairs bureaus, and other bodies, and policy resources should be incorporated into distinctive collections for focused development and promotion.

3.1.4 Ecological Research Data Resource Support

In supporting the demand for agricultural ecological security and scientific research, which accounts for the highest proportion, the library' s ecological research data resource support is the cornerstone of its service system. Specific measures include the following: First, embed research data services. While ensuring the integrity and continuity of collections of core academic literature resources in ecology, environmental science, soil science, plant protection, and other related fields, libraries should strengthen the proactive service capacity of subject librarians, provide dedicated consultation for Science and Technology Backyard research projects, and move services forward to the research initiation stage. Second, build a research data management platform. On the basis of evaluating and introducing scientific data resources such as ecological and environmental monitoring data, meteorological data, and soil survey data, the library should take the lead in evaluating, introducing, or collaboratively developing a dedicated research data management platform, providing Science and Technology Backyard research teams with full-process technical support covering data storage, identification, long-term preservation, and sharing, thereby ensuring standardized management and sustainable use of research data. To guarantee the effective management and in-depth use of research data, the following mechanisms need to be established: first, strengthen embedded liaison between subject librarians and research teams, gain an in-depth understanding of the full-cycle needs of their research projects, and provide full-process support from resource recommendation to data management; second, promote the construction and maintenance of the above platform as an ongoing task.

3.1.5 Intelligent Knowledge Engineering Resource Support

To respond to the development trend of smart agriculture, the library' s intelligent knowledge engineering resource support must be forward-looking. Its construction priorities include the following: First, introduce intelligent tools and carry out empowerment training. On the basis of evaluating and introducing key technological resources such as artificial intelligence, machine learning, big data analysis, and knowledge graphs, the library' s information technology center and innovation service center should take the lead in regularly organizing application workshops on tools such as Python and geographic information systems (GIS). Typical scenarios should be selected, and intelligent applications such as pest and disease image recognition should be piloted for Science and Technology Backyards, so as to promote the implementation of technologies. Second, systematically build a knowledge engineering resource system. While providing Science and Technology Backyards with high-quality experimental datasets, libraries should evaluate and purchase the software tools and algorithm libraries needed for knowledge graph construction, and systematically collect existing knowledge graph models, ontologies, and representative cases in the agricultural field, forming an agricultural knowledge graph case library to provide reference and support for the construction of complex knowledge systems. To ensure the rationality and effectiveness of introducing frontier technological resources, the following mechanisms need to be established: first, set up a special demonstration fund for emerging technological resources; second, establish a joint demonstration mechanism with relevant departments such as schools of computer and information science.

The five-dimensional resource support system constructed in this study is not a set of isolated resource silos, but an organic whole. The maximization of its effectiveness depends on deep collaboration and integration among resources across all dimensions. This collaborative mechanism is mainly reflected at three levels: data sharing, knowledge association, and service integration. At the data-sharing level, the international market data integrated through economic intelligence resource support can provide market-oriented analysis for technology promotion strategies in applied technology resource support, while the data managed through ecological research data resource support can provide training data and validation evidence for model development in intelligent knowledge engineering resource support. At the knowledge-association level, knowledge graph technology can be used to connect policy literature resources, applied technology solutions, market information, and ecological research findings, thereby constructing a cross-domain knowledge network that supports discovery-based and associative knowledge retrieval and provides integrated solutions to complex problems. At the service-integration level, multidimensional resources can be pushed based on user profiles; for example, researchers concerned with soil improvement can be provided with academic literature, practical technical manuals, relevant policies, and soil data query tools. To achieve the above collaboration, libraries need to build a unified resource discovery system and establish a cross-departmental resource construction coordination group, ensuring interconnection and interoperability among all types of resources from the source. At the same time, they should continue to promote co-construction and sharing of resources among libraries, research institutes, governments, and enterprises, forming a powerful knowledge infrastructure to support innovation in Science and Technology Backyards.

3.2 Implementation Strategies for the Resource Support System

The five-dimensional resource support system and its collaborative mechanism described above provide a systematic resource support framework for Science and Technology Backyards. However, to ensure that this system can continuously maintain its advanced nature and operate efficiently while avoiding rigidity, this paper proposes the following five key implementation strategies. These strategies are intended to continuously monitor, enrich, improve, evaluate, and expand the established system, forming a closed-loop management system of "construction—operation—optimization."

3.2.1 Establish a Demand-Oriented Dynamic Monitoring and Adjustment Mechanism

To ensure that the resource support system develops in step with Science and Technology Backyards, the primary task is to establish a normalized mechanism for dynamic demand monitoring and adjustment. By mining data such as literature downloads, search terms, and citation relationships, and by conducting regular user surveys (questionnaires and interviews), libraries can continuously track trends in the evolution of Science and Technology Backyard needs. Resource support should be transformed from a static project into a dynamic process of "monitoring—evaluation—adjustment." In this process, pilot applications may be carried out first. For example, in the case of training empowered by intelligent tools, changes in demand can be investigated to dynamically monitor implementation results; training participation and tool-use frequency can be combined for scientific evaluation; and subsequent training content and formats can be adjusted in a timely manner based on the evaluation results, thereby promoting iterative optimization of implementation strategies as needs change.

3.2.2 Deepen "Government-Industry-University-Research-Application" Collaboration to Enrich the System of Distinctive Resources

On the basis of clearly identifying needs, libraries should take the initiative to become deeply integrated into the "government-industry-university-research-application" collaborative ecosystem of Science and Technology Backyards. This is not only a powerful supplement to the various types of resources in the five-dimensional resource support system, but also the key to giving the overall system local characteristics and practical relevance. For example, cooperation with local governments can ensure the accuracy and forward-looking nature of policy resources; cooperation with agricultural enterprises can introduce market technologies and demand information; and cooperation with research teams can support the joint construction of distinctive data resource repositories with independent intellectual property rights, such as local variety resource repositories and pest-and-disease image databases. Deep integration into the regional development pattern can provide a clear local-characteristic orientation for resource construction, making services more grounded and more effective[22].

3.2.3 Strengthen Knowledge Organization and Discovery to Improve Resource Utilization Efficiency

To realize the transformation of resources from being merely "available" to being "easy to use," it is necessary to strengthen the in-depth knowledge-based organization and discovery of both purchased and self-built resources. Technologies such as knowledge graphs, subject indexing, and intelligent tagging should be used to aggregate and present resources according to the demand themes of Science and Technology Backyards. In this process, attention should be paid to innovation and support in the construction pathways of library literature resources[23]. Through systematic methods, scattered and heterogeneous resources can be integrated into an organic knowledge system that is logically clear and easy to use, thereby maximizing the value of resources.

3.2.4 Establish a Scientific Benefit Evaluation System to Drive Precise Optimization

To scientifically judge the effectiveness of resource support and guide the direction of optimization, quantifiable key performance indicators should be formulated, such as database usage rates, the adoption of customized intelligence reports, downloads of important resources, user satisfaction scores, and actual support cases in which resources serve specific research projects or technology promotion. Regular input–output benefit evaluations of the effectiveness of five-dimensional resource construction should be conducted, and the results should be used as the core basis for resource renewal, adjustment, or elimination. This will improve the efficiency of fund utilization and promote precise optimization of the support system.

3.2.5 Expand Service Fields to Amplify the Overall Value of the Resource System

Library resource support should not be limited to resource provision within the institution. Instead, libraries should actively expand their service fields and strive to become catalysts of knowledge innovation and amplifiers of value within the innovative "field effect" of Science and Technology Backyards[24]. For example, by systematically integrating best-practice cases from Science and Technology Backyards, libraries can build an "Ethics and Values Knowledge

Base for Agricultural Modernization" ; by embedding resource modules such as distinctive technical guides and policy tools into local smart-agriculture service platforms or rural-revitalization digital platforms, they can construct a full-chain service network of "technology—policy—market," thereby enhancing the contribution and influence of the library resource system in rural revitalization.

4 Conclusions and Prospects

4.1 Research Conclusions

This study shows that deeply mining user needs is an effective pathway for resolving the mismatch between library supply and demand. Through text mining and similarity quantification methods based on TF-IDF and HDBSCAN clustering, five categories of core needs were revealed, providing key methodological support for promoting the shift of service models from experience-driven to data-driven. The five-dimensional resource support system constructed in this study, together with its supporting implementation strategies, forms an organic whole that realizes synergistic effects through data sharing and resource complementarity, providing a transformation framework for libraries to move from passive provision toward proactive support. Ultimately, this study offers practical ideas for transforming macro-level agricultural and rural science-and-technology service policies into operable programs, and lays a resource foundation for libraries to accurately connect with "government-industry-university-research-application" and serve the rural revitalization strategy.

4.2 Research Prospects

Limited by time, sample size, and methods, this study can be further deepened in the following aspects in the future. First, the scale of data samples and the scope of regional coverage should be expanded, and interviews, questionnaires, and other methods should be combined to conduct more precise quantitative analysis of needs. Second, the effectiveness of the resource support system should be further verified in practice, the framework system should be continuously iterated and optimized, and a standardized solution that can be promoted should be formed. In this way, a more operable resource support program can be provided for implementing the "promotion of the Science and Technology Backyard model," effectively helping to meet the practical requirement of "solving livelihood issues and pursuing scholarship in the service of rural revitalization."

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Research on the Resource Support System in Agricultural and Forestry University Libraries Based on User Needs: A Case Study of the Science and Technology Backyard at China Agricultural University

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Abstract To address the disconnection between university library resource development and users' actual needs and to enhance the precision of resource support, this study analyzes 1,906 work logs from 28 Science and Technology Backyards (STBs) at China Agricultural University. An analytical framework of "data cleaning–topic clustering–demand identification" is established. Using TF-IDF and HDBSCAN clustering methods, five core resource needs are identified: agro-economic systems, markets and globalization; application of agricultural production technologies and socialized services; agricultural policies and livelihood security systems; agro-ecological security and research systems; and agricultural intelligent systems and knowledge engineering. Accordingly, a demand-oriented, five-dimensional resource support system and a dynamic mechanism for multi-dimensional collaboration in data sharing and resource complementarity are proposed. Furthermore, a package of implementation strategies is constructed, including: dynamic monitoring and adjustment of demands; collaborative resource development through "government-industry-research-education-application" synergy; enhancement of knowledge organization and discovery efficiency; optimization driven by scientific benefit evaluation; and expansion of service domains. This study provides a basis for transforming resource development in agricultural and forestry university libraries from a "passive supply" to an "active support" model and offers a resource foundation for serving rural revitalization.

Keywords Science and Technology Backyard; Text mining; Demand analysis; Resource development; Resource support; University library